UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/542,616	07/18/2005	Teodor Aastrup	066935-076983	7334

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EXAMINER
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ART UNIT	PAPER NUMBER
2856	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

	Application No.	Applicant(s)
Office Action Summary	10/542,616	AASTRUP ET AL.
	Examiner	Art Unit	
	JOHN FITZGERALD	2856	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on <u>25 February 2011</u>.

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) <u>1-13 and 23-28</u> is/are pending in the application.

   4a) Of the above claim(s) <u>6,7 and 11-13</u> is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) <u>1-5,8-10 and 23-28</u> is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on <u>18 July 2005</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

   Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

   Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   a)☒ All   b)☐ Some * c)☐ None of:

   1. ☐ Certified copies of the priority documents have been received.

   2. ☐ Certified copies of the priority documents have been received in Application No. _____.

   3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

   * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
   Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
   Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1.   In view of the Appeal Brief filed on 25 February 2011, PROSECUTION IS HEREBY

REOPENED. Previous nonstatutory double patenting rejections are set forth below set forth

below.

        To avoid abandonment of the application, appellant must exercise one of the following

two options:

        (1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37

CFR 1.113 (if this Office action is final); or,

        (2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an

appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee

can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have

been increased since they were previously paid, then appellant must pay the difference between

the increased fees and the amount previously paid.

        A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing

below:

        /Hezron Williams/

        Supervisory Patent Examiner, Art Unit 2856

Response to Arguments

2.   Applicant's arguments with respect to all pending claims have been considered but are

moot in view of the new ground(s) of rejection.

Claim Objections

3.   Claims 5 and 26 are objected to because of the following informalities: It appears that

the claim incorporates the incorrect units of "mm^2" instead of "mm" regarding the distance

between the first electrode edge and the crystal surface edge. As to claim 26, the claim recites

"crystal area" For clarity reasons, these should state "crystal surface area" or "first crystal

surface area." Lastly, the Examiner has noticed that the claim language of some of the

withdrawn claims are inconsistent with earlier claim listings. The Examiner suggests the

Applicant perform a thorough review of the instant pending and withdrawn claims for any errors

or discrepancies. Appropriate correction is required.

Claim Rejections - 35 USC § 102

4.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or
on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed
in the United States before the invention by the applicant for patent or (2) a patent granted on an application for
patent by another filed in the United States before the invention by the applicant for patent, except that an
international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this
subsection of an application filed in the United States only if the international application designated the United
States and was published under Article 21(2) of such treaty in the English language.

5.   Claims 1-5, 8-10 and 26-28 are rejected under 35 U.S.C. 102(b) as being anticipated by

US 3,872,411 to Watanabe et al. Watanabe et al. disclose a thickness shear mode piezoelectric

resonator having all of the structural limitations recited thus capable of the functionality recited

in the preamble, including a quartz crystal plate (11) having a first crystal surface (See all

Figures) having an edge and second crystal surface, the first crystal surface comprises a first

electrode having a continuous surface area (Watanabe et al: col. 6, lines 35-49), the first

electrode having a diameter of "smaller/less than 0.57 mm" which translates to a continuous

electrode surface area (A) of: $A \leq \pi \bullet (0.285 \text{ mm})^2 \leq 0.26 \text{ mm}^2$, thus an area less than 15 mm^2

(as recited in claim 1), less than 10 mm^2 (as recited in claim 2, at least 0.05 mm^2 (as recited in

claim 3) and an electrode and the second crystal surface comprises a second electrode (as recited

in claim 1); wherein the continuous surface area of the first electrode is smaller than the first

crystal surface (see Figures) (as recited in claim 4); wherein the distance from the first electrode

edge to the crystal edge is at least 0.2 mm or 1 mm or 2 mm (proportions of Figures and

Watanabe et al.: col. 8, lines 36-60) diameter of crystal plate is 5-8mm) (as recited in claims 5,

27 and 28); first and second contacting areas (14, 14') associated with the first and second

surfaces of the crystal (as recited in claim 8); a first electrode having first and second sides and

wherein a first contacting area is connected to a second side of the of the first electrode (see

Figure 5) (as recited in claim 9); wherein the first and second crystal surfaces are flat (as recited

in claim 10); wherein the first electrode has a continuous area that is 0.1-90% of the crystal

surface area (as recited in claim 26).

6.   Claims 1-5, 8, 10, 23, 24 and 26-28 are rejected under 35 U.S.C. 102(b) as being

anticipated by JP 04236336 A to Toda et al. Toda et al. disclose a thickness shear mode

piezoelectric resonator having all of the structural limitations recited thus capable of the

functionality recited in the preamble, including a quartz crystal plate (1) having a first crystal

surface (See Figs. 1 and 7) having an edge and second crystal surface, the first crystal surface

comprises a first electrode having a continuous surface area, the first electrode having a diameter

of "3.2 mm" which translates to a continuous electrode surface area (A) of: $A = \pi \bullet (1.6 \text{ mm})^2 =$

8.0 mm^2 , thus an area less than 15 mm^2 (as recited in claim 1), less than 10 mm^2 (as recited in

claim 2), at least 0.05 mm^2 (as recited in claim 3) and wherein the and an electrode and the

second crystal surface comprises a second electrode (as recited in claim 1); wherein the

continuous surface area of the first electrode is smaller than the first crystal surface (see Figures)

(as recited in claim 4); wherein the distance from the first electrode edge to the crystal edge is at

least 0.2 mm or 1 mm or 2 mm (7 mm – 3.2 mm = 3.8 mm) (as recited in claims 5, 27 and 28);

first and second contacting areas associated with the first and second surfaces of the crystal (as

recited in claim 8); wherein the first and second crystal surfaces are flat (as recited in claim 10);

wherein the first electrode has a continuous area that is 0.1-90% of the crystal surface area (as

recited in claim 26) and wherein the thickness shear mode resonator senses or measures and

provides structure capable of sensing/measuring a liquid (as recited in claims 23 and 24).

7.   Claims 1-5, 8, 10, 23, 24 and 26-27 are rejected under 35 U.S.C. 102(b) as being

anticipated by U.S. 5,552,274 to Oyama et al. Oyama et al. disclose a thickness shear mode

piezoelectric resonator for use in a sensor arrangement for detecting or measuring an analyte in a

medium by mass changes including a quartz crystal plate (1) having a first crystal surface (See

Figs. 1, 6, 7, 9 and 10) having an edge and second crystal surface, the first crystal surface

comprises a first electrode having a continuous surface area, the first electrode having a diameter

of "0.5 mm" or "1.0 mm" or "50 x 10^{-6} m) (Oyama et al.: col. 9) which translates to a continuous

electrode surface area (A) of: A $= \pi \bullet (0.25\ mm)^2 = 0.2\ mm^2$ (or .079 mm^2 or 2.0 x $10^{-3}\ mm^2$,

for electrode diameters of 1 mm and 50 x 10 m^{-6}, respectively), thus an area less than 15 mm^2 (as

recited in claim 1), less than 10 mm^2 (as recited in claim 2), and at least 0.05 mm^2 (as recited in

claim 3) and an electrode and the second crystal surface comprises a second electrode (as recited

in claim 1); wherein the continuous surface area of the first electrode is smaller than the first

crystal surface (see Figures) (as recited in claim 4); wherein the distance from the first electrode

edge to the crystal edge is at least 0.2 mm or 1 mm (4.0 mm – 1.0 mm = 3.0 mm which equates

to a distance between edges of 1.5 mm) (as recited in claims 5 and 27); first and second

contacting areas associated with the first and second surfaces of the crystal (as recited in claim

8); wherein the first and second crystal surfaces are flat (as recited in claim 10); wherein the first

electrode has a continuous area that is 0.1-90% of the crystal surface area (as recited in claim 26)

and wherein the thickness shear mode resonator senses or measures and provides structure

capable of sensing/measuring a liquid (as recited in claims 23 and 24).

8.   Claims 1, 3-5, 8, 10, 23, 24, 26 and 27 are rejected under 35 U.S.C. 102(b) as being

anticipated by U.S. 5,455,475 to Josse et al. Josse et al. disclose a thickness shear mode

piezoelectric resonator for use in a sensor arrangement for detecting or measuring an analyte in a

medium by mass changes including a quartz crystal plate (2) having a first crystal surface (See

Figs. 1-6) having an edge and second crystal surface, the first crystal surface comprises a first

electrode having a continuous surface area, the first electrode having a diameter of "4 mm"

(Josse et al.: col. 7, lines 54-64) which translates to a continuous electrode surface area (A) of: A

$= \pi \bullet (2\ mm)^2 = 12.6\ mm^2$, thus an area less than 15 mm^2 (as recited in claim 1) and at least

0.05 mm^2 (as recited in claim 3), and an electrode and the second crystal surface comprises a

second electrode (as recited in claim 1); wherein the continuous surface area of the first electrode

is smaller than the first crystal surface (see Figures) (as recited in claim 4); wherein the distance

from the first electrode edge to the crystal edge is at least 0.2 mm or 1 mm (7.0 mm – 4.0 mm =

3.0 mm which equates to a distance between edges of 1.5 mm) (as recited in claims 5 and 27);

first and second contacting areas associated with the first and second surfaces of the crystal (as

recited in claim 8); wherein the first and second crystal surfaces are flat (as recited in claim 10);

wherein the first electrode has a continuous area that is 0.1-90% of the crystal surface area (as

recited in claim 26) and wherein the thickness shear mode resonator senses or measures and

provides structure capable of sensing/measuring a liquid (as recited in claims 23 and 24).

9.   Claims 1-4, 8, 10, 23, 24 and 26 are rejected under 35 U.S.C. 102(e) as being anticipated

by U.S.2003/0076743 to Thompson et al. Thompson et al. disclose a a thickness shear mode

piezoelectric resonator for use in a sensor arrangement for detecting or measuring an analyte in a

medium by mass changes including a quartz crystal plate (2) having a first crystal surface (See

Figs. 2, 4 and 5) having an edge and second crystal surface, the first crystal surface comprises a

first electrode having a continuous surface area, the first electrode having a diameter of "5 mm"

and the removal of a circular area of the electrode having a diameter of "1.5 mm" (Thompson et

al.: paras. 0033 and 0043) which translates to a total continuous electrode surface area (A) of: A

= $\pi \bullet (5\ \text{mm})^2 - \pi \bullet (1.5\ \text{mm})^2 = 9.6\ \text{mm}^2$, thus an area less than 15 mm^2 (as recited in claim

1); an area less than 10 mm^2 (as recited in claim 2) and at least 0.05 mm^2 (as recited in claim 3),

and an electrode and the second crystal surface comprises a second electrode (as recited in claim

1); wherein the continuous surface area of the first electrode is smaller than the first crystal

surface (see Figures) (as recited in claim 4); first and second contacting areas associated with the

first and second surfaces of the crystal (as recited in claim 8); wherein the first and second

crystal surfaces are flat (as recited in claim 10); wherein the first electrode has a continuous area

that is 0.1-90% of the crystal surface area (see figures, as recited in claim 26) and wherein the

thickness shear mode resonator senses or measures and provides structure capable of

sensing/measuring a liquid (as recited in claims 23 and 24).

10.   Claims 1-5, 8, 10, 23, 24 and 26-28 are rejected under 35 U.S.C. 102(b) as being

anticipated by Non Patent Literature journal article "Analysis of the Radial Dependence of Mass

Sensitivity for Modified-Electrode Quartz Crystal Resonators" to Josse et al. Josse et al. disclose

a thickness shear mode piezoelectric resonator for use in a sensor arrangement for detecting or

measuring an analyte in a medium by mass changes including a quartz crystal plate (2) having a

first crystal surface (See Figs. 1-6) having an edge and second crystal surface, the first crystal

surface comprises a first electrode having a continuous surface area, the first electrode having a

diameter of "3 mm" (see Figure 2) which translates to a continuous electrode surface area (A)

of: $A = \pi \bullet (1.5 \text{ mm})^2 = 7.1 \text{ mm}^2$, thus an area less than 15 mm^2 (as recited in claim 1); an

areal less than 10 mm^2 (as recited in claim 2) and at least 0.05 mm^2 (as recited in claim 3), and

an electrode and the second crystal surface comprises a second electrode (as recited in claim 1);

wherein the continuous surface area of the first electrode is smaller than the first crystal surface

(see Figures 1a and 1b) (as recited in claim 4); wherein the distance from the first electrode edge

to the crystal edge is at least 0.2 mm or 1 mm (7.0 mm – 3.0 mm = 4.0 mm which equates to a

distance between edges of 2.0 mm) (as recited in claims 5, 27 and 28); first and second

contacting areas associated with the first and second surfaces of the crystal (as recited in claim

8); wherein the first and second crystal surfaces are flat (as recited in claim 10); wherein the first

electrode has a continuous area that is 0.1-90% of the crystal surface area (as recited in claim 26)

and wherein the thickness shear mode resonator senses or measures and provides structure

capable of sensing/measuring a liquid (as recited in claims 23 and 24).

Claim Rejections - 35 USC § 103

11.   The text of those sections of Title 35, U.S. Code not included in this action can be found

in a prior Office action.

12.   Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Non Patent

Literature journal article "Analysis of the Radial Dependence of Mass Sensitivity for Modified-

Electrode Quartz Crystal Resonators" to Josse et al. Josse et al. disclose a thickness shear mode

piezoelectric resonator for use in a sensor arrangement for detecting or measuring an analyte in a

medium by mass changes having all of the elements and functionality recited above. Josse et al.

further disclose, in relation to Figure 2 (reproduced below) that: "Moreover, it is also observed

that the smaller electrode surface of the "4-7" is more sensitive than the "7-7" electrode QCR, as

will shown experimentally later." (Note: 4-7 and 7-7 refer to the diameters of the electrodes in

millimeters, thus corresponding to electrode areas of $\pi \bullet (2.0 \ \text{mm})^2 = 12.6 \ \text{mm}^2$ and $\pi \bullet (3.5$

$\text{mm})^2 = 38.5 \ \text{mm}^2$ as depicted in Figure 1). Josse et al. further disclose the experimental data in

Figure 7, matching the theoretical data/curves of Figure 2, and states: "The results (theory and

experiments) clearly indicate, as expected, that the "4-7" QCR has a higher sensitivity than the
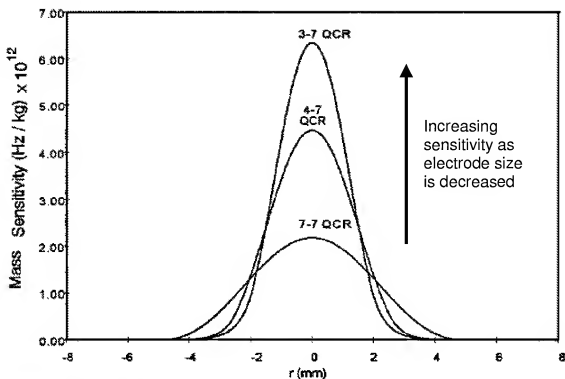
"7-7" electrode."

Figure 2. Calculated radial dependence of the differential mass sensitivity for three "*n*—*m*"-type electrode QCRs using an 11-MHz AT-cut quartz resonator and electrode mass loading factor $R = 0.006$.

13.   Furthermore, although not formally addressed in the text by Josse et al., Figure 2 (see above) clearly shows a curve for a "3-7" electrode QCR (i.e. an electrode area of $\pi \bullet (1.5 \text{ mm})^2$ = 7.1 mm^2), that clearly indicates an ***even greater mass sensitivity*** (emphasis added) than the "4-7" electrode QCR, as indicated by the higher overall sensitivity value/peak . This clearly leads one of ordinary skill in the art that decreasing the size/area of the electrode leads to greater mass sensitivity, since Figure 2 clearly indicates increasing sensitivity as one decreases the electrode diameter from 7 mm, to 4 mm and then to 3 mm, thus directly corresponding to decreasing size/area. Therefore, it would have been obvious to one having ordinary skill in the art at the

time the invention was made to employ even smaller electrodes, for example, "2-7" or "1-7"

electrodes, thus including electrodes having 1-5 mm^2 (corresponding to electrode diameter range

of 1.28-2.52 mm), (as recited in claim 25) to increase the sensitivity.

Conclusion

14.   The prior art made of record and not relied upon is considered pertinent to applicant's

disclosure.   Applicant is invited to review PTO form 892 accompanying this Office Action

listing Prior Art relevant to the instant invention cited by the Examiner.

15.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to John Fitzgerald whose telephone number is (571) 272-2843. The

examiner can normally be reached on Monday-Friday from 7:00 AM to 3:30 PM. If attempts to

reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron Williams,

can be reached on (571) 272-2208. The central fax phone number for the organization where

this application or proceeding is assigned is 571-273-8300. Information regarding the status of

an application may be obtained from the Patent Application Information Retrieval (PAIR)

system. Status information for published applications may be obtained from either Private PAIR

or Public PAIR. Status information for unpublished applications is available through Private

PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov.

Should you have questions on access to the Private PAIR system, contact the Electronic Business

Center (EBC) at 866-217-9197 (toll-free).

/John Fitzgerald/
Primary Examiner, Art Unit 2856
5/6/11